10 CFR 50.73

BOSTON EDISON
Pilgrim Nuclear Power Station
Rocky Hill Road
Plymouth, Massachusetts 02360

Ralph G. Bird
Senior Vice President — Nuclear

January 8, 1990
BECo Ltr 90-003

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Docket No. 50-293
License No. DPR-35

Dear Sir:

The enclosed Licensee Event Report (LER) 89-038-00, "Automatic Scram at 95 Percent Power During Surveillance Testing due to False Low Water Level Signal", is submitted in accordance with 10 CFR Part 50.73.

Please do not hesitate to contact me if there are any questions regarding this report.

For R. G. Bird

DWE/bal

Enclosure: LER 89-038-00

cc: Mr. William Russell
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Rd.
King of Prussia, PA 19406

Sr. NRC Resident Inspector - Pilgrim Station

Standard BECo LER Distribution

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U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

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TITLE (4) Automatic Scram at 95 Percent Power During Surveillance Testing due to False Low Water Level Signal

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
									N/A	0 5 0 0 0
1 2	0 8	8 9	8 9	0 3 8	0 0	0 1	0 8	9 0	N/A	0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 9 5	20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
Douglas W. Ellis - Senior Compliance Engineer	5 0 8 7 4 7 - 1 8 1 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)

		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On December 8, 1989 at 0308 hours, an unplanned automatic Reactor Protection System (RPS) scram signal and reactor scram occurred at 95 percent reactor power. The scram signal resulted in responses that included a Turbine-Generator trip.

The direct cause for the scram signal was a (false) low Reactor Vessel (RV) water level signal that occurred while returning a local RV water level indicator (differential pressure type) to service following a satisfactory calibration performed by a qualified technician. The cause for the event was a minor hydraulic transient that occurred while carefully and slowly opening a low side (active leg) needle type manifold valve in accordance with the approved procedure. The level indicator shares sensing lines common to adjacent RPS level transmitters.

Corrective actions taken included the satisfactory calibration of the local level indicator(s) while shutdown on December 8, 1989. Corrective actions being explored are improvements for calibrating the local level indicators including possible change of the manifold valve handle(s) or replacement of the related needle type manifold valves with metering type valves. The calibration procedure is being revised to be performed while shutdown.

This event occurred during power operation with the reactor mode selector switch in the RUN position. The RV pressure was 1027 psig with the RV water temperature at 547 degrees Fahrenheit. This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv) and this event posed no threat to the public health and safety.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

EVENT DESCRIPTION

On December 8, 1989 at 0308 hours, an unplanned automatic Reactor Protection System (RPS) scram signal and reactor scram occurred while at 95 percent reactor power. The scram signal was the result of a false low Reactor Vessel (RV) water level trip signal that occurred during a scheduled surveillance test.

As expected, the scram signal resulted in an automatic sequence of designed responses that included a Turbine-Generator trip. The Turbine trip included the following designed responses:

- Automatic closing of the Main Steam System/Turbine Valves (stop valves, control valves, combined intermediate valves), automatic opening of the Turbine Bypass Valves, and a trip of the Turbine lockout relay (286-2).

- Automatic opening of the Generator Field Breaker. The Generator trip was the designed response to the loss of field that resulted from the automatic opening of the field breaker.

- Automatic transfer of the source of 4160 VAC power for the Auxiliary Power Distribution System from the Unit Auxiliary Transformer to the Startup Transformer.

- Automatic opening of the 345 KV switchyard air circuit breakers ACB-104 (352-4) and ACB-105 (352-5).

As expected, the RV water level decreased in response to the scram because of shrink (i.e., decrease in the void fraction in the RV water). The RV water level momentarily decreased to approximately -12.5 inches (narrow range level). The decreased RV water level, to less than the low RV water level setpoint (calibrated at approximately +12 inches), resulted in the following designed responses:

- Automatic actuation of the Reactor Building Isolation Control System (RBIS). The actuation resulted in the automatic closing of the Reactor Building/Secondary Containment System (SCS) supply and exhaust ventilation dampers (Trains 'A' and 'B'), and the automatic start of Trains 'A' and 'B' of the SCS/Standby Gas Treatment System (SGTS).

  - During subsequent post trip review, one of two in-series SCS/Refuel Floor exhaust ventilation dampers (AON-90 and -91) was identified to have not completely closed. The in-series damper AON-91 closed completely.

- Automatic actuation of appropriate portions of the Primary Containment Isolation Control System (PCIS) that resulted in the following responses:

  - Automatic closing of the inboard and outboard Primary Containment System (PCS)/Reactor Water isolation valves (AO-220-44 and -45).

- Automatic closing of the inboard and outboard PCS Group 2 (two)/Sample System isolation valves that were open.

- The PCS Group 3 (three)/Residual Heat Removal System isolation valves, in the closed position, remained closed.

- Automatic closing of the inboard and outboard PCS Group 6 (six)/Reactor Water Cleanup (RWCU) System isolation valves and a temporary interruption in RWCU System operation.

Initial Control Room utility licensed operator responses were orderly and included the following activities. At approximately 0309 hours, the process of verifying the insertion of the control rods began and the reactor mode selector switch (RMSS) was moved from the RUN position to the SHUTDOWN position in accordance with procedure 2.1.6, "Reactor Scram". Emergency Operating procedure EOP-01, "RPV Control", was initiated at approximately 0309 hours because the RV water level decreased to less than +9 (nine) inches narrow range level. The Feedwater System pumps' sequential trip selector switch was moved to the OFF position and pump 'A' was manually tripped in accordance with procedure (2.1.6) and the speed of the Recirculation System pumps automatically decreased to 60 percent flow. Procedure 2.1.5 section 'B', "Operation After Reactor Scram with MSIVs Open", and procedure 2.1.7 (Attachment 1), "RPV Temperature and Pressure Check List", were initiated in accordance with procedure (2.1.6). At approximately 0311 hours, the RV water level returned to normal (i.e., +30 inches) and the Feedwater System pumps 'B' and 'C' were manually tripped. The speed of the Recirculation System pumps 'A' and 'B', being manually decreased from 60 percent flow, automatically decreased to approximately 20 percent flow in response to the decreased Feedwater System flow (i.e., less than 20 percent flow). At approximately 0315 hours, the RBIS circuitry was reset. The Reactor Building/SCS supply and exhaust ventilation dampers were reopened and the SGTS was returned to normal standby service. At approximately 0320 hours, the PCIS circuitry was reset and the RWCU System was returned to service. At approximately 0322 hours, the keylocked scram discharge volume (SDV) high water level scram bypass switch was moved to the BYPASS position and the RPS circuitry was reset. Except for two SDV (east) level elements (LE-302-82C and -82D), the SDV circuitry reset as expected at 0330 hours. The two (resistance temperature device) level elements function to provide an SDV (east) high water level signal to RPS Channel A2 and B2, respectively. The scram function for the elements was operable. Level elements LE-302-82C and -82D later reset at 0414 hours and 0619 hours, respectively. The PCS/Main Steam drain valves were opened at 0700 hours. The turbine trip was reset at 0845 hours.

Failure and Malfunction Reports 89-472, 89-473 and 89-474 were written to document the scram and the problems with damper AON-90 and the SDV (east) high water level elements. The NRC Operations Center was notified of the scram in accordance with 10 CFR 50.72 on December 8, 1989 at 0527 hours.

This event occurred during power operation with the RMSS in the RUN position. The RV pressure was approximately 1027 psig with the RV water temperature at 547 degrees Fahrenheit.

BACKGROUND

Prior to the event, steady state operating conditions existed and included the following. The reactor power level was approximately 95 percent. The RV water level was normal (+30 inches narrow range level) and was being controlled automatically in the three element control mode. The Recirculation System master flow controller (CON-262-22) was in the manual control mode. The speed of the Recirculation System pumps 'A' and 'B' was steady and in the local manual control mode. The Condensate and Feedwater Systems were operating with all of the systems' pumps in service. The sequential trip selector switch for the Feedwater System pumps was in the ON position.

On December 8, 1989 at approximately 0230 hours, a scheduled (quarterly) surveillance test began. The test was being performed in accordance with procedure 8.M.2-2.1.2 (Rev. 10) Attachment 'A', "Reactor Vessel High/Low Water Level and Pressure Instrument Calibration Test". This attachment includes a (wet) calibration of two water level indicators LI-263-59A and -59B that function to provide a local indication of RV water level in the Reactor Building at Panels C-2205 and C-2206, respectively.

The two local level indicators are differential pressure type indicators (ITT/Barton). The indicators' low side is the active side (leg) and the indicators' high side is the reference side. Each indicator is equipped with valves for removing and returning the indicator to service. The procedure (8.M.2-2.1.2) contains cautions and specific sequential steps and substeps for isolating, connecting test equipment, calibration of the indicator, disconnecting the test equipment, and returning the indicator to service.

After a satisfactory calibration of LI-263-59A, the test equipment was disconnected in accordance with procedure (Attachment A step 6) and the level indicator was being returned to service in accordance with procedure (Attachment A step 7). At substep 7.e, the indicator's low side (active leg) manifold valve was to be opened. The indicator's high side (reference leg) manifold valve was in the CLOSED position and is opened at a subsequent substep (7.g). The utility non-licensed Instrumentation and Control (I&C) technicians were in communication with the Control Room for the test. One technician was actively performing the procedural steps and the other technician, approximately five feet away and in clear view of the active technician, was recording the performance of the procedural steps. The active technician, heeding the procedural cautions for hydraulic interaction with adjacent level and pressure instrumentation including those for the RPS, exercised considerable care during the calibration.

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For step 7.e, the technician counter-actively used both hands to slowly and carefully open the low side needle type manifold valve. This technique was used to overcome the valve's (expected) initial opening resistance and to simultaneously control and prevent the manifold valve from opening quickly as the valve's opening resistance is overcome. However, despite the adequate procedural cautions/steps and considerable care and attention to detail exercised by the technician, the opening of the low side manifold valve for LI-263-59A resulted in a minor hydraulic transient on Panel C-2205. The hydraulic transient was sufficient to be sensed by adjacent RV water level transmitters LT-263-57A (to RPS Channel A1) and LT-263-57B (to RPS Channel B1) as a low RV water level condition. The active and reference legs for the local level indicator(s) share sensing lines common to the level transmitters.

CAUSE

The direct cause for the scram signal was a minor hydraulic transient that resulted in a (false) low RV water level signal. The hydraulic transient, sensed by adjacent RPS level transmitters that share common sensing lines with the local level indicator, was sufficient to result in coincident low RV water level signals to RPS Channels 'A1' and 'B1'.

A critique was conducted on December 8, 1989 in accordance with procedure 1.3.63, "Conduct of Critiques and Incident Investigations". The critique was held to determine the actions and circumstances that led to the event. The critique was attended by appropriate personnel including the I&C technicians who were performing the calibration. The critique concluded that the cause for the event was a minor hydraulic transient that occurred when the low (active) side manifold valve for LI-263-59A was opened. The needle type manifold valve was slowly and carefully opened by a qualified technician in accordance with the procedure (8.M.2-2.1.2) approved for the activity being performed.

A post trip review was conducted on December 8, 1989 in accordance with procedure 1.3.37, "Post Trip Reviews". The initiating cause for the scram signal was investigated separately via the critique. The post trip review concluded that, except for the incomplete closing of the Refuel Floor exhaust ventilation damper (AON-90) and the delayed reset of the SDV (east) high water level elements LE-302-82C and -82D, the RPS scram signal and subsequent systems' responses and operator actions were appropriate.

The SCS/Refuel Floor exhaust ventilation damper (AON-90) did not completely close because of rubbing of the damper blades and stationary edge seals. The rubbing resulted from inward flexure of the damper edge seals that occurred because of normal differential pressure developed by the related exhaust fans (VEX-201A and -201B). Damper AON-90 is a 64 inch square damper manufactured by Pacific Air Products.

The SDV (east) high water level elements (LE-302-82C and -82D) reset automatically. The reset, although taking longer than the other RTD type SDV level elements, does not affect the scram function provided by the level elements. The RTD type SDV level elements were manufactured by Fluid Components Incorporated, model number FR72-4HTRDLL.

CORRECTIVE ACTION

The following corrective actions have been taken:

- The calibration of LI-263-59A and LI-263-59B was completed with satisfactory results at 1810 hours while shutdown on December 8, 1989. The calibrations were performed in accordance with procedure (8.M.2-2.1.2 Attachment A). No procedural changes were necessary for the calibrations.

- The operation of the Reactor Building/Refuel Floor exhaust ventilation damper (AON-90) was corrected by pressing the damper edge seals outward in accordance with vendor instructions. Damper AON-90 is a Train 'B' SCS/exhaust ventilation damper. The closing function of the Train 'B' supply and exhaust ventilation dampers, including damper AON-90, was tested with satisfactory results on December 10, 1989. The test was performed in accordance with procedure 8.M.2-1.5.8.4 (Rev. 20) and documented in Attachment 1, "SGTS and Reactor Building Isolation Device Data Sheet".

- The SDV (east) level element LE-302-82D, was functionally tested with satisfactory results while shutdown on December 9, 1989. The test was performed in accordance with procedure 8.M.1-20 (Rev. 23) Attachment 1 (one), "CRD Scram Discharge System Instrument Functional Test". The element and circuitry responded as expected and in accordance with the procedure and vendor manual.

The following corrective actions are being taken or planned:

- Procedure 8.M.2-2.1.2 is being revised. Essentially, the focus of the revision is to calibrate the local level indicators (LI-263-59A and -59B) using a separate procedural attachment while shutdown. The performance of the procedure is scheduled in accordance with the surveillance program.

- An Engineering Service Request (ESR 89-911) has been written to explore possible improvements for calibrating the local level indicators LI-263-59A and LI-263-59B. Currently, the possible improvements include a change to the handle(s) of the manifold valve(s), the replacement of the needle type manifold valve(s) with a metering type valve, and/or the installation of a pressure tap on the high side of the manifold.

- Another Engineering Service Request (ESR 89-910) has been written to explore a possible improvement to the valving sequence identified in the procedure (8.M.2-2.1.2) for removing or returning a local level indicator (LI-263-59A or -59B) to service.

- Further investigation of the SDV (east) level elements (LE-302-82C and -82D) is being considered for the mid-cycle outage that is currently scheduled to begin in March 1990.

The unit was returned to commercial service on December 12, 1989 at 1515 hours.

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SAFETY CONSEQUENCES

This event posed no threat to the public health and safety.

The scram signal was the designed response to the (false) low RV water level signal. The Turbine-Generator trip was the expected designed response to the scram signal.

The momentary low RV water level was the expected response to the scram and accompanying shrink of the RV water. The PCIS and RBIS actuations were the expected designed responses to the low RV water level resulting from the scram.

The Reactor Building/Refuel Floor exhaust ventilation damper AON-91 closed automatically for the containment function. The damper (AON-91) is located in-series with damper AON-90 that did not completely close.

The SDV (east and west) high water level scram function provided by the respective level elements can be bypassed only when the keylocked RMSS is in the SHUTDOWN or REFUEL position and if the keylocked SDV high water level scram bypass switch is in the BYPASS position. A longer than normal reset time for an SDV high water level element(s) could delay a complete reset of the RPS circuitry in that the SDV bypass switch would have to remain in the BYPASS position until the level element(s) reset.

The (Technical Specification 2.2.I) limiting safety system setting for actuation of the Core Standby Cooling Systems (CSCS) is -49 inches. During the event, the lowest RV water level that occurred, approximately -12.5 narrow range level, was approximately 33.5 inches above the CSCS setpoint (calibrated at approximately -46 inches narrow range level). In addition, the water level (-12.5 inches) was approximately 115 inches above the level that corresponds to the top of the active fuel zone (i.e., at approximately -127.5 inches).

This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv) because the RPS was actuated.

SIMILARITY TO PREVIOUS EVENTS

A review was conducted of Pilgrim Station Licensee Event Reports (LERs) submitted since January 1984. The review focused on LERs submitted in accordance with 10 CFR 50.73(a)(2)(iv) that involved a similar RPS scram signal or reactor scram. The review identified a similar event reported in LER 50-293/88-002-01.

For LER 88-002-01, an unplanned RPS scram signal occurred while performing the same surveillance test (8.M.2-2.1.2) during an outage on January 17, 1988 at 0113 hours. At the time of the event, the RMSS was in the SHUTDOWN position and the control rods were in the inserted position. The scram signal occurred when the same local level indicator (LI-263-59A) was being returned to service after a (dry) calibration of the level indicator. The cause for the scram signal was procedural inadequacy in that the procedure (8.M.2-2.1.2) did not contain sufficient instructions or cautions for isolating, connecting and disconnecting test equipment, and returning the local level indicator(s) to service. The procedure was subsequently revised to include the instructions and cautions, and the method for a wet type calibration of the local level indicators.

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ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are as follows:

COMPONENTS	CODES
Circuit Breaker, AC	52
Damper (AON-90)	DMP
Indicator, Level (LI-263-59A)	LI
Valve, Isolation (PCS valves)	ISV
Valve, Root (Manifold Valve)	RTV

SYSTEMS	
Containment Isolation Control System (PCIS,RBIS)	JM
Engineered Safety Features Actuation System (RPS,PCIS,RBIS)	JE
Feedwater System	SJ
Main Generator System	TB
Main Turbine System	TA
Plant Protection System (RPS)	JC
Reactor Building (SCS)	NG
Reactor Building Environmental Control System	WA
Reactor Recirculation System	AD
Reactor Water Cleanup (RWCU) System	CE
Standby Gas Treatment (SGTS) System	BH